Claims

1. A method of generating an optically sectioned image of a specimen comprising the steps of:

illuminating the specimen with a temporally modulating, spatially periodic illumination pattern;

imaging said specimen on a conjugate image plane;

acquiring a plurality of signals at respective positions on said image plane, each signal corresponding to the incident light intensity at that position and having an oscillatory component caused by the modulation of the illumination pattern; and

measuring a characteristic of the oscillatory component of each of the signals, whereby the measured characteristics when combined in their relative positions generate an optically sectioned image of the specimen.

2. A method of generating an image according to claim 1, wherein the measured characteristic is the amplitude of the oscillatory component.

3. A method of generating an image according to claim 1 or 2, further comprising the step, between the acquisition and measuring steps, of filtering each acquired signal to isolate the oscillatory component therefrom.

4. A method of generating an image according to any one of the previous claims, wherein the illumination pattern is a fringe pattern.

5. A method of generating an image according to claim 4, wherein the fringe pattern is an interference pattern.

6. A method of generating an image according to any one of the previous claims, wherein the illumination pattern is

modulated by moving the illumination pattern relative to the specimen object plane.

7. A method of generating an image according to any one of the previous claims, wherein the illumination pattern is modulated to produce an illumination modulation frequency of at least 100 Hz

8. A method of generating an image according to any one of the previous claims, wherein the incident light at the image plane comprises reflected or transmitted light.

9. A method of generating an image according to any one of the previous claims, wherein the incident light at the image plane comprises light which is emitted by the specimen in response to the illumination pattern.

10. A method of processing optical signals to generate an optically sectioned image comprising:

receiving data which comprises a plurality of signals previously acquired by performing the steps of (i) illuminating a specimen with a temporally modulating, spatially periodic illumination pattern, (ii) imaging said specimen on a conjugate image plane, and (iii) acquiring a plurality of signals at respective positions on said image plane, each signal corresponding to the incident light intensity at that position and having an oscillatory component caused by the modulation of the illumination pattern, and

measuring a characteristic of the oscillatory component of each of the signals, whereby the measured characteristics when combined in their relative positions generate an optically sectioned image of the specimen.

11. A microscopy imaging apparatus comprising:

illumination means for illuminating a specimen with a temporally modulating, spatially periodic illumination pattern;

imaging means for imaging said specimen on a conjugate image plane;

acquisition means for acquiring a plurality of signals at respective positions on said image plane, each signal corresponding to the incident light intensity at that position and having an oscillatory component caused by the modulating illumination pattern; and

processor means for measuring a characteristic of the oscillatory component of each of the signals, whereby the measured characteristics when combined in their relative positions generate an optically sectioned image of the specimen.

12. A microscopy imaging apparatus according to claim 11, wherein the processor means also filters each acquired signal to isolate the oscillatory component therefrom before measuring the characteristic of the oscillatory component.

13. A microscopy imaging apparatus according to claim 12, wherein the illumination means modulates the illumination pattern to produce a predetermined modulation frequency and the processor means is adapted to filter the acquired signals at substantially the same frequency.

14. A microscopy imaging apparatus according to any one of claim 11 to 13, wherein the illumination means comprises means for generating a spatially periodic interference illumination pattern.

 

15. A microscopy imaging apparatus according to any one of claims 11 to 14, wherein the acquisition means comprises an array of light detectors for respectively detecting the light intensities at the plurality of image plane positions.

16. A microscopy imaging apparatus according to claim 15, wherein the array of light detectors is a two-dimensional array.

17. A microscopy imaging apparatus according to any one of claims 11 to 16, wherein the processor means comprises a plurality of signal processors for respectively measuring the characteristics of the oscillatory components of the acquired light signals.

18. A microscopy imaging apparatus according to any one of claims 13 to 17, wherein illumination means modulates the illumination pattern so that the modulation frequency is at least 100 Hz.

19. A conversion kit for converting a conventional microscope into the microscopy imaging apparatus of any one of claims 13 to 18, the conversion kit comprising:

illumination means for illuminating a specimen with a temporally modulating, spatially periodic illumination pattern;

acquisition means for acquiring a plurality of signals at respective positions on a conjugate image plane onto which the microscope images the specimen, each signal corresponding to the incident light intensity at that position and having an oscillatory component caused by the modulating illumination pattern, and

processor means for measuring a characteristic of the oscillatory components of each of the signals, whereby the

measured characteristics when combined in their relative positions generate an optically sectioned image of the specimen.